graph shown. The present illustration shows the sudden act of closure, by which the turning movement is brought about, almost completed.

Of photographs taken with the special apparatus described, two illustrations are given; the first that of a plaice larva 13 mm. in length, and magnified five times; the second that of a crustacean, one of the Mysidacea, 2 mm. in length, magnified fifteen times. This photograph shows very distinctly the two statocysts on the uropods or appendages of the sixth abdominal segment, and gives a good general view of the animal.

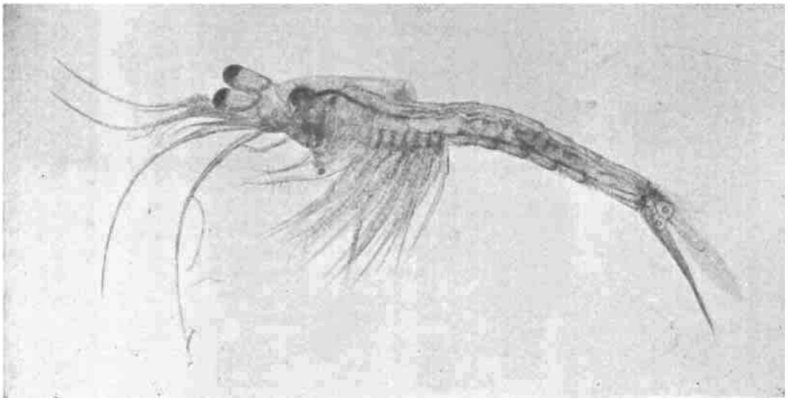
FIG. 5.—A Mysidacea.

Higher magnifications of any particular part are obtained as described by slipping the microscope into the apparatus.

In addition to the above methods, the natural colours of marine animals may be recorded on the autochrome plate. The autochrome plate is particularly useful when it is desired to make a permanent record of a stained specimen where the staining is of a fugitive character.

FRANCIS WARD.

SOME EXTINCT VERTEBRATE ANIMALS FROM NORTH AMERICA.[1]

A NEW volume of collected papers, published by the American Museum of Natural History, New York, enables us to realise how important and numerous are the additions to our knowledge of extinct vertebrate animals still made by systematic explorations in North America. The contributions now received deal with the work of only four years, 1904–8, accomplished by one institution; but they make great advances in nearly all parts of the subject to which they relate, and their value is increased by the excellent text-figures and plates with which they are illustrated. The pioneer discoveries of Leidy, Marsh, and Cope furnished for many years a continual series of surprises for the student of extinct vertebrates; their successors during the past decade and a half have not only filled in many details in the preliminary view thus obtained, but have also been scarcely less successful in recovering unexpected groups and missing links. Present explorers have, indeed, the advantage of being able to pursue their work in the remote west in peaceful leisure, without any armed escort, and so have facilities for determining the relative positions of the strata from which they excavate the various fossils. In the early days, with hurried traverses, there was a tendency to decide the relative ages of the fossils solely by their own peculiar features, without any exact observations in the field. The result was sometimes an argument in a vicious circle. As shown by the volume now before us, that is all changed. We find detailed descriptions of specimens from the Permian of Texas, the Upper Cretaceous of Montana, the Eocene of Wyoming, and the Miocene of South Dakota. Accompanying them are well-illustrated exact accounts of all these formations and localities, determining the relative ages of the genera and species which were obtained from them.

The scientific work of the palæontologists in the American Museum is of two kinds. Part is devoted to the reconstruction and mounting of skeletons of general interest; part is concerned with the most detailed and special research, for which it often happens that not more than mere fragments are available. The publications record the results in both directions, and thus provide ample material, not only for the specialist, but for anyone interested in the broader features of natural history. It must also be added that the reconstructed skeletons are prepared with the greatest scientific care. The fine example of the Columbian mammoth now described, for example, was mounted after an elaborate study of the arrangement of the footprints of a living elephant and the attitude of its limbs when walking. The skeletons of Equidæ were similarly mounted after studies of the living horse—especially after a study of the Arab, to which one article in the new volume is devoted. Among startling mounts for which existing animals give little help may be specially mentioned the reconstructed skeleton of Naosaurus, which is one of the primitive reptiles from the Permian of Texas not hitherto found in a complete state. It is a long-bodied, squat reptile, with a formidable array of sabre-like teeth, and a high, thorny frill along the back, which is supported by the much-elongated neural spines of the vertebræ (Fig. 1). Prof. Osborn, who describes this specimen, is careful to explain exactly on what material the various parts of the recon-

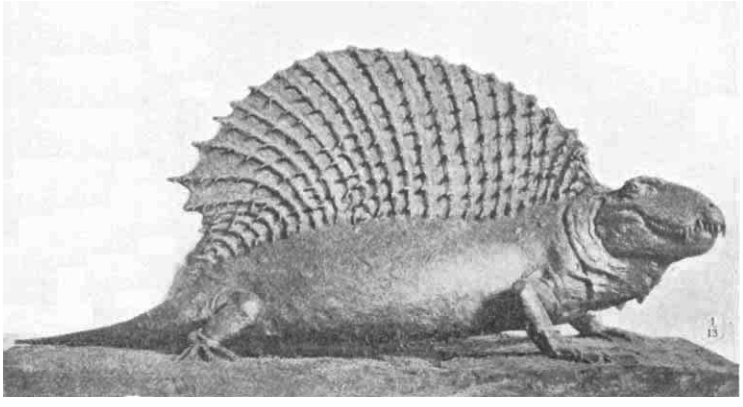
FIG. 1.—Model of *Naosaurus claviger*, by Mr. C. R. Knight.

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[1] "Fossil Vertebrates in the American Museum of Natural History." Department of Vertebrate Palæontology. Vol. iii., Articles collected from the American Museum Bulletin for the years 1904–8, by H. Fairfield Osborn, &c. (New York, 1909.)

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struction are based, so that each may judge of the extent to which it is trustworthy.

Perhaps the most interesting real novelty is a small skeleton from the Middle Eocene of Wyoming, determined by Prof. Osborn to belong to a primitive armadillo. Fragments of this animal were obtained some years ago by Dr. J. L. Wortman, and ascribed by him to a Lemuroid under the name of Metacheiromys. Four good specimens now seem to show that it is truly an armadillo, differing chiefly from the typical existing armadillos in "the probable presence of a leathery instead of a bony shield, of an enamel covering on the single large caniniform teeth in the upper and lower jaws and the degeneration of other teeth." This discovery confirms the suppositions of Marsh, Wortman, and Schlosser as to the existence of Edentata in North America in the Eocene period; and it adds to the difficulties of understanding the early Tertiary mammal faunas of South America.

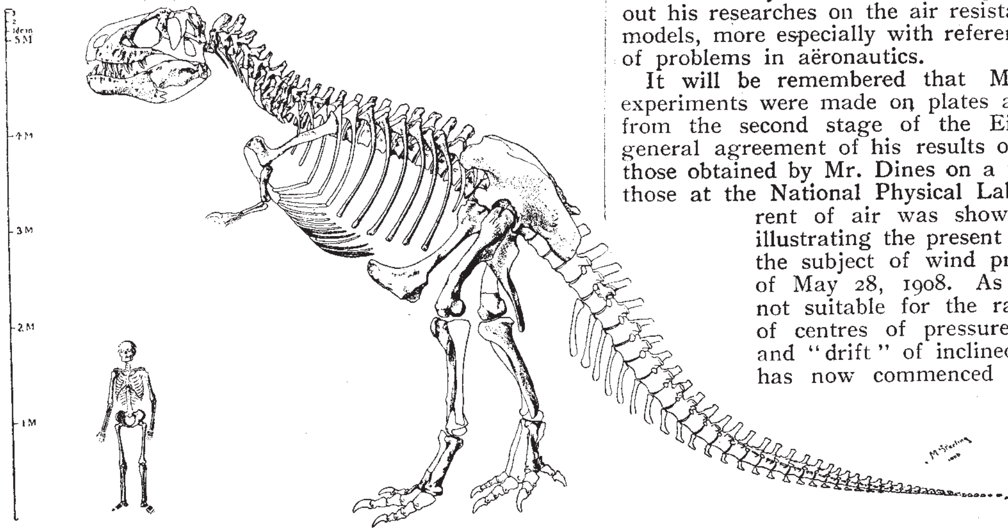


FIG. 2.—Restoration of *Tyrannosaurus rex*. From the type skeleton, American Museum of Natural History.

Another astonishing discovery is that of a colossal carnivorous Dinosaur, Tyrannosaurus (Fig. 2), from the Upper Cretaceous (Laramie formation) of Wyoming and Montana. It has hitherto been supposed that the flesh-eaters were all much smaller than the largest vegetable-feeders among Dinosaurs; but here is a reptile like Megalosaurus, with a skull from 4 to 5 feet in length, and when standing on its heavy hindquarters reaching a height of from 16 to 17 feet. Another new herbivorous Dinosaur, Ankylosaurus, from the same geological formation, measures 14 feet in length, and is armoured like the South American Glyptodons.

The technical papers on remains of horses and rhinoceroses, by Prof. Osborn and others, and on camels and deer, by Dr. Matthew, are of extreme scientific value. The discussion of the extinct horses is especially exhaustive, and the result is that it becomes impossible at present to recognise any exact genetic series. Mr. Gidley even remarks that "there is a considerable phyletic hiatus between the groups of the Equidæ, which are as yet not bridged over by intermediate forms"; and he adds that this hiatus is particularly marked between the Anchitherium-group and the Protohippus-group, which "greatly overlap each other in time." Dr. Matthew's explanation of most of our difficulties in understanding the evolution of the European and North American Tertiary mammalia is that northern Asia was their actual place of origin. He thinks that "in Europe, on one side of this centre, in America, on the other side, we have parallel series of approximate phylogenies; sometimes closer in the one country, sometimes in the other." Until the early Tertiary mammalia of northern Asia are discovered, we cannot advance much further towards real origins.

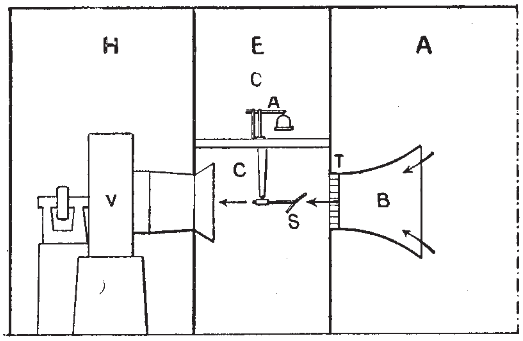
Prof. Osborn and his associates are indeed to be congratulated on the wide import of the work they have done, and the excellent manner in which it is published. We would commend it to the notice of all students of biology.

A. S. W.

EXPERIMENTS ON AIR RESISTANCE.

IN *La Nature* (February 26) there is a description by M. Fournier of the new laboratory which M. Eiffel recently erected for the purpose of carrying out his researches on the air resistance of plates and models, more especially with reference to the solution of problems in aëronautics.

It will be remembered that M. Eiffel's earlier experiments were made on plates and models let fall from the second stage of the Eiffel Tower. The general agreement of his results on flat plates with those obtained by Mr. Dines on a whirling table and those at the National Physical Laboratory in a current of air was shown in the curves illustrating the present writer's article on the subject of wind pressure in NATURE of May 28, 1908. As this method was not suitable for the rapid determination of centres of pressure, and the "lift" and "drift" of inclined plates, M. Eiffel has now commenced experiments in a current of air, and the manner in which this current is maintained presents some novel and interesting features. Hitherto, experiments by this method have been carried out by suspending the models in a long channel with parallel sides through which air was drawn by means of a fan. This arrangement is open to two objections—(1) the difficulty of maintaining the velocity of the current uniform across the channel, and (2) the limited size of the models which could be used without an appreciable effect on the resistance due to the walls of the channel. The first difficulty is overcome by introducing resistances to the flow where necessary, which is a long and tedious process, and the second by limiting the size of the models to within two or three per cent. of the area of the channel. The novelty of M. Eiffel's method consists in his using a comparatively short channel, and in suspending his models in a closed



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